JOURNAL
OF THE
WASHINGTON ACADEMY OF SCIENCES
VOL. 12 JUNE 4, 1922 No. 11

BOTANY.—*New Passifloras from Mexico and Central America.*[1] E. P. KILLIP, National Museum. (Communicated by William R. Maxon.)

For some time past the writer has been engaged in a study of the tropical North American species of *Passiflora*, with particular reference to Mexico and Central America, a region from which few species have been described since Master's comprehensive revision of the American species in 1872. Since the publication of final results is unavoidably delayed, it seems advisable to publish in advance descriptions of certain of the new species, in order that the names may be available.

Passiflora (*Cieca*) **apetala** Killip, sp. nov.

Glabrous throughout; stem angulate, grooved; tendrils solitary; stipules setaceous, 2 to 4 mm. long; petioles 1.5 to 3 cm. long, glandless; leaves broadly cuneate in outline, 3 to 7 cm. long, 2 to 6 cm. broad, bilobate (lobes subapproximate, one-half to quite as long as the undivided portion of blade, obtuse, mucronate), at base subrotund or cuneate, membranaceous, strongly 3-nerved; peduncles in pairs, slender, 2 cm. long; bracts setaceous, deciduous, 2 to 3 mm. long; flowers small, 1.2 to 1.8 cm. wide; sepals oblanceolate, 6 mm. long, 2.5 mm. broad, yellowish green, inconspicuously nerved; petals none; filaments of faucial corona in a single series, filiform, 2.5 mm. long; middle corona membranaceous, plicate, strongly incurved about base of gynophore; basal corona annular; gynophore slender, glabrous, 3 mm. high; filaments capillary, 2 mm. long, the anthers ovate, 1.5 mm. long; ovary depressed-globose, 1 mm. in diameter, glabrous; styles 2.5 mm. long, filiform, the stigmas semiorbicular; fruit black, globose, 8 to 10 mm. in diameter; seeds broadly ovate, 2.5 mm. long, 2 mm. broad, transversely rugose with 6 or 7 nearly parallel ridges.

Type in the U. S. National Herbarium, no. 358,766, collected on Mount Irazú, Costa Rica, altitude 1,000 meters, December 11, 1898, by H. Pittier (no. 13,043); distributed as *P. dicthophylla.*

The foliage of this plant resembles that of certain species of the section *Decaloba* with bilobate leaves, notable *Passiflora ornithoura*, and is unlike that of most of its apetalous allies. From *Passiflora ornithoura* it is dis-

[1] Published by permission of the Secretary of the Smithsonian Institution. Received May 3, 1922.

tinguished not only by the absence of petals but by its longer and narrower sepals and the longer, filiform threads of its faucial corona.

Passiflora arida (Mast. & Rose) Killip.

Passiflora foetida arida Mast. & Rose, Contr. U. S. Nat. Herb. **5:** 182. 1899.

Recent collections from Lower California and northwestern Mexico indicate that this plant is sufficiently distinct from *Passiflora foetida* to deserve specific rank.

Passiflora (*Dysosmia*) **fruticosa** Killip, sp. nov.

Low shrub with an erect caudex, 20 to 40 cm. high, and a few short, sprawling branches; branches and tendrils densely white-lanate; stipules semiannular about the stem, deeply cleft into filiform, gland-tipped divisions; petioles 5 to 15 mm. long, densely lanate, destitute of true petiolar glands but bearing numerous gland-tipped hairs; leaves orbicular in outline, usually 1.5 to 2 cm. long and broad, rarely up to 3.5 cm., 3-lobed (lobes subequal, rounded), at base cordate, 3 to 5-nerved, densely glandular-ciliate, lanate with soft, white to dark brown wool, glutinous; peduncles 1 to 2.5 cm. long; bracts 2- or 3-pinnatisect, hirsute, copiously covered with gland-tipped hairs; flowers 2.5 to 3 cm. in diameter; sepals ovate-lanceolate, 1 to 1.3 cm long, 0.6 cm. broad at base, densely velvety-pubescent without, glabrous within; petals 5 to 7 mm. long, 4 mm. broad, obovate, glabrous; filaments of faucial corona in several series, the outer two or three about 1 cm. long, filamentous, the succeeding series minute, capillary, 1.5 to 2 mm. long; middle corona membranous, not folded, the apex minutely denticulate; basal corona membranous, 1.5 mm. high, the margin entire, recurved; ovary subglobose, silky-pubescent; fruit globose, 2.5 cm. in diameter, densely pubescent with long, silky hairs; seeds oblong, minutely 3-toothed at the apex, truncate at the base, flattened, 5 mm. long, 2.5 mm. broad, reticulate with about 25 meshes to each face.

Type in the U. S. National Herbarium, no. 638,347, collected at Santa María Bay, Lower California, March 19, 1911, by J. N. Rose (no. 16,285).

In addition to the type, specimens from Espiritu Santo, Magdalena Island, and San Francisco Island have been examined. Its shrubby aspect and extreme oiliness, resulting from numerous gland-tipped hairs, distinguish this species from *Passiflora arida*, while its smaller flowers, its proportionately broader petals, and longer faucial corona threads differentiate it from *P. palmeri*.

Passiflora (*Plectostemma*) **cookii** Killip, sp. nov.

Glabrous throughout; stem terete, striate, glaucous; stipules reniform, 1.5 cm. long, 3 cm. broad, glaucous, crenate; petioles 3 to 4 cm. long, glandless; leaves broadly ovate, 8 cm. long, 6 to 7 cm. broad, very obscurely 3-lobed (middle lobe deltoid, obtuse, mucronulate), at base truncate, dark green above, glaucous beneath, peltate about 1.2 cm. from base, quintuplinerved; peduncles about 8 cm. long; bracts not seen; flowers white, 3.5 to 4.5 cm. wide; sepals ovate-lanceolate, 1.5 cm. long, 1 to 1.2 cm. broad, obtuse; petals ovate-lanceolate, abruptly narrowed at the base, obtuse, 1.5 cm. long, 0.8 cm. broad, white, spotted with red; filaments of faucial corona in 2 series, those of the outer series 1 cm. long, dilated at the apex, those of

the inner barely 3 mm. in length, capitate; middle corona membranous, plicate, the apex incurved, fimbrillate; basal corona annular; gynophore 1 cm. high; filaments linear, 6 mm. long, 1.6 mm. wide, white, spotted with red; anthers oblong, 5 mm. long, 2.5 mm. broad; ovary subglobose; styles filiform, 4 mm. long; stigmas reniform, 1 mm. in diameter.

Type in the U. S. National Herbarium, no. 408,302, collected near Finca Sepacuité, Alta Verapaz, Guatemala, April 13, 1902, by O. F. Cook and R. F. Griggs (no. 593).

But one specimen of this species has been examined and upon this no bracts were present. In other respects it bears a strong resemblance to *P. hahnii* and it is to be suspected that it has foliaceous deciduous bracts. It may be distinguished from *P. hahnii* by its larger, crenate stipules, the glaucous under surface of the leaves, and its smaller flowers. From *P. membranacea*, another species of this group, it differs in its spreading sepals and petals, its shorter peduncles, and in the elongate middle lobe of its leaves.

Passiflora (*Plectostemma*) **costaricensis** Killip, sp. nov.

Stem angulate, hirsute with long, spreading, light-brown hairs, glabrescent below; stipules subulate, 6 to 8 mm. long; petioles 1.5 to 2 cm. long, densely hirsute, glandless; leaves oval or suborbicular-oval in outline, 9 to 13 cm. long, 7 to 11 cm. broad, 2-lobed (lobes deltoid, acute or acuminate, mucronate, extending about one-third the length of blade, subapproximate, the terminal sinus nearly semicircular), at base rounded, 3-nerved, membranous, hirsute, especially beneath; peduncles solitary, 1.5 cm. long, articulate at the middle, sparingly pilose; bracts none; flowers 4.5 to 5 cm. wide; sepals linear-lanceolate, 2 cm. long, 0.4 cm. broad, obtuse, hirsute without, glabrous within, the central portion dark green, the margin hyaline, white; petals linear-oblong, 8 mm. long, 2 mm. broad, obtuse, hyaline; filaments of faucial corona in a single series, narrowly ligulate, as long as the petals; middle corona closely plicate, the margin incurved; basal corona annular; ovary minutely puberulent; fruit ellipsoidal, 7 to 8 cm. long, 1 to 1.5 cm. in diameter at the middle, long-tapering at both ends; seeds slightly flattened, narrowly oblong, 3 mm. long, 1.5 mm. broad, black, shining, transversely rugose with 6 or 7 ridges, the ridges smooth, parallel, the axis curved, the beak 0.9 mm. long, recurved.

Type in the U. S. National Herbarium, no. 941,592, collected in the forests of Xirores, Talamanca, Costa Rica, February, 1895, by A. Tonduz (no. 9327).

ADDITIONAL SPECIMENS EXAMINED:

GUATEMALA: Cubilquitz, Alta Verapaz, alt. 350 meters, September, 1901, *von Tuerckheim* (J. D. Smith, no. 7877).

COSTA RICA: Las Vueltas, Tucurrique, January, 1899, *Tonduz* 13,146. Between La Junta and Florida, July 11, 1920, *Rowlee & Stork* 619. Livingston, on Río Reventazon, July 11, 1920, *Rowlee & Stork* 723.

This species is to be distinguished from *Passiflora capsularis* by the shape of the leaves and the character of the faucial corona. In *P. costaricensis* the leaves are longer than broad and are rounded at the base; they have a semicircular sinus, formed by relatively approximate lobes. In *P. capsu-*

laris the leaves are broader than long and are cordate at the base; they have an irregular sinus, formed by widely divergent lobes and a more or less prominent intermediate lobe. The faucial corona filaments are 2-ranked in *P. costaricensis* and 1-ranked in *P. capsularis*.

Passiflora (*Plectostemma*) **heydei** Killip, sp. nov.

Stem obscurely 4-angled, grooved, glabrate below, sparingly hispidulous above; tendrils solitary, glabrate or hispidulous; stipules in pairs, oblong-falcate, 6 mm. long, 3 mm. broad, long-cuspidate, minutely hispidulous, sparsely ciliate; petioles 2 to 5 cm. long, flattened, hispidulous, biglandular, the glands borne within 1 cm. of the apex, clavate, 1.5 mm. long, 0.8 to 1 mm. in diameter; leaves suborbicular-ovate or deltoid in outline, 5 to 8 cm. long, 6 to 10 cm. broad, 3-lobed to slightly below the middle (lobes acute, the central one ovate or ovate-lanceolate, narrowed or frequently broadest at the base, the lateral divergent at an angle of about 70° from the midrib), deeply cordate at base, 3-nerved, repandly dentate or denticulate with mucronulate teeth, membranous, dark green and hispidulous with minute hooked hairs above, paler and densely soft-pubescent beneath; penduncles in pairs, densely hispidulous, 1.5 to 2 cm. long, spreading at right angles; bracts 3, setaceous, 2.5 to 3 mm. long, borne about 1 cm. below the base of the flower, approximate or the uppermost slightly remote; flowers about 2 cm. wide; sepals linear-oblong, 1 to 1.3 cm. long, 3 mm. broad, obtuse, densely hispid and green outside, inside glabrous, white, mottled with red, the apex terminating in a horn about 3.5 mm. long; petals linear-lanceolate, 7 mm. long, 2 mm. broad, obtuse, white (?); filaments of faucial corona in a single series, capillary, 5 to 6 mm. long; middle corona membranous, plicate, the margin slightly incurved, crenulate; secondary middle corona annular, midway between the preceding and the base of the gynophore; basal corona arising at the base of the gynophore, membranous, adnate to the floor of the tube, at length free, 2 mm. long; gynophore glabrous, 4 or 5-angled, about 1 mm. in diameter, swollen at the base to a diameter of 2 mm.; anthers ovate, 2 mm. long, 1.5 mm. broad; ovary subglobose, densely hispidulous, glaucous; fruit globose, 2 cm. in diameter, hispidulous, glaucous; seeds somewhat compressed, obovoid, 4 mm. long, abruptly tapering at the base, mucronate at the apex, reticulate, the central mesh or the 2 central meshes 1 mm. in diameter, the surrounding 8 or 9 meshes averaging 0.8 mm. in diameter.

Type in the U. S. National Herbarium, no. 207,154, collected at Casillas, Department of Santa Rosa, Guatemala, September, 1892, by Heyde and Lux (J. D. Smith, no. 3772); distributed as "*Passiflora sicyoides* Cham.? aut n. sp.?" Duplicates in the Gray and John Donnell Smith herbaria.

In the shape of its leaves and the size of its seeds this species resembles *P. exsudans* Zucc. It is readily distinguished by the location of the petiolar glands at the apex of the petioles and by its densely hispidulous, glaucous fruit.

Passiflora (*Plectostemma*) **panamensis** Killip, sp. nov.

Glabrous throughout; stem angulate, grooved, flexuous; tendrils filiform, very slender; stipules linear-falcate, 4 to 5 mm. long; petioles 1.5 to 2.5 cm. long, glandless; leaves suborbicular in outline, 5 to 8 cm. long, 5 to 7 cm. broad, 3-lobed (the lobes approximate, subequal or the middle slightly

longer, about one-third the length of blade, triangular, acute or somewhat obtuse, mucronate), rounded or subpeltate at base, subpergamentaceous, 3-nerved, ocellate beneath ; peduncles 2.5 to 4 cm. long, articulate about 6 mm. below the flower; bracts setaceous, deciduous, two borne at the point of articulation, the third near the middle of the peduncle; flower about 3 cm. wide; sepals oblong-lanceolate, 1.2 to 1.4 cm. long, 6 to 7 mm. broad, obtuse, yellowish green; petals rose-colored, spatulate, 8 mm. long, 3 to 4 mm. broad; filaments of faucial corona in 2 series, the outer 7 mm. long, dilated and 3-angled toward the apex, the inner 3 mm. long, capillary and minutely capitellate; middle corona membranous, pink, plicate, erect, crenulate; basal corona annular; anthers linear-oblong 2.5 to 3 mm. long; ovary globose sparingly strigillose; styles subangulate, 3.5 mm. long; fruit globose, 2 cm. in diameter, glabrate; seeds straw-colored, obovate, apiculate, strongly flattened, transversely rugose with about 6 sharp somewhat rugulose ridges.

Type in the U. S. National Herbarium, no. 715,818, collected along the Sambú River, southern Darién, Panama, above the tide limit, February, 1912, by H. Pittier (no. 5556).

The lobation of the leaves of this species differs materially from that of its nearest allies. The arrangement and appearance of the coronae suggest *P. biflora*, but the flower is larger, the petals are rose-colored, and the leaves are distinctly 3-lobed, the middle lobe generally being slightly the largest.

Passiflora (*Plectostemma*) **rovirosae** Killip, sp. nov.

Stem 4-angled, striate, glabrate below, pubescent or pilosulous above; stipules narrowly falcate-subulate, 8 to 10 mm. long; petioles densely pubescent, 1.5 to 2 cm. long, glandless; leaves subtruncate-ovate in outline, 8 to 10 cm. long, 6 to 7 cm. broad, bilobate (lobes one-eighth to one-quarter the length of blade, somewhat divergent, acute, mucronulate), deeply cordate at base, slightly narrowed toward apex, membranous, above dark green, glabrate, or puberulent on the nerves, beneath pale, densely pubescent or tomentulous; peduncles 1 to 1.5 cm. long, 1-flowered, in pairs on short, axillary, often leafy, puberulent branches 1 to 2 cm. long, the inflorescence thus appearing racemose; bracts none; flowers 3 to 4 cm. wide; sepals oblong, 1.3 to 1.5 cm. long, 0.4 cm. broad, obtuse; petals oblong, obtuse, 0.9 to 1.1 cm. long, 0.3 cm. broad; filaments of faucial corona in two series, the outer filiform, about 1 cm. long, the inner capillary, barely 4 mm. long; middle corona membranous, erect, 4 to 5 mm. high, closely plicate; basal corona annular; gynophore angled, 7 mm. high, glabrous; ovary narrowly ovoid, 6-angled, canescent; anthers oblong, 4 mm. long, 1.5 mm. broad; styles capillary, 6 mm. long; stigmas reniform, 2 mm. broad; fruit ellipsoid or fusiform, tapering at both ends, 4 to 5 cm. long, 1.2 to 1.5 cm. in diameter at the middle.

Type in the herbarium of the Academy of Natural Sciences, Philadelphia, collected at Atasta, Tabasco, Mexico, June 15, 1890, by J. N. Rovirosa (no. 813). Photograph in U. S. National Herbarium.

ADDITIONAL SPECIMEN EXAMINED:

VERACRUZ: Misantla, *Purpus* 5881.

The fruit of this species indicates relationship with *Passiflora capsularis*,

from which it can be distinguished by its longer leaves and by the inflorescence. Its peduncles are borne in pairs on short, axillary branches, rather than singly in the axils of the leaves of the main stem.

Passiflora (*Plectostemma*) **talamancensis** Killip, sp. nov.

Stem angulate, striate, minutely puberulent; stipules linear-subulate, 3 to 8 mm. long; petioles 1 to 2 cm. long, puberulent or tomentellous, glandless; leaves cuneate-obovate or cuneate-oval in outline, 6 to 12 cm. long, 3 to 7 cm. broad, very shortly 3-lobed or 3-toothed at apex (middle lobe normally longest, 5 to 10 mm. long, usually deltoid), cuneate or rounded at base, narrowed above the middle, subcoriaceous, glabrous and lustrous above, dull and puberulent beneath, strongly 3-nerved, ocellate beneath; peduncles slender, 2 to 4 cm. long; bracts setaceous, 2 mm. long, deciduous; flowers 2.5 to 3.5 cm. wide; sepals oblong, obtuse, about 1.5 cm. long, 0.5 cm. broad, green without, white within; petals two-thirds as long as the sepals, white; filaments of faucial corona in two series, those of the outer series falcate-spatulate, 5 to 7 mm. long, white (?), those of the inner series capillary, 1.5 mm. long, white, purple at the tips; middle corona close to the faucial, membranous, plicate, 2 mm. long, erect, the margin minutely crenulate, slightly recurved; basal corona annular; gynophore glabrous, purple-striate; ovary globose, densely tomentellous; styles filiform, 4 mm. long; stigmas reniform; seeds ovate, 4 mm. long, 2 mm. broad, transversely rugose with 6 or 7 minutely rugulose ridges, asymmetrical, the margin bearing a single knob on one side just below the apex.

Type in the U. S. National Herbarium, no. 941,600, collected in forests at Xirores, Talamanca, Costa Rica, at an altitude of 100 meters, February, 1895, by A. Tonduz (no. 9329).

In texture the foliage of this species resembles that of *Passiflora trisetosa*. The leaves, however, are larger and more elongate, and the central lobe is much more prominent. The flowers of the two species present certain important differences. *P. talamancensis* has a 2-ranked faucial corona, an erect middle corona, and a globose, softly tomentellous ovary. *Passiflora trisetosa* has a single-ranked faucial corona, an incurved middle corona, and an ovoid, strigillose ovary.

Passiflora (*Granadilla*) **platyloba** Killip, sp. nov.

Stem stout, terete, striate, glabrous; stipules coriaceous, narrowly linear, 1 to 1.2 cm. long, strongly 3-nerved, orange-yellow, deciduous; petioles 6 to 7 cm. long, glabrous, bearing about 2 cm. above the base two sessile, flattened glands 2 mm. in diameter; leaves suborbicular-ovate in outline, 10 to 14 cm. long, 12 to 18 cm. broad, 3-lobed to the middle (the central lobe broadly ovate, abruptly acuminate, mucronate, 8 to 9 cm. long, 7 to 8 cm. broad, the lateral lobes divergent from the midrib at an angle of about 45°), at base deeply cordate, crenulate or subentire, biglandular in the sinuses, 3 to 5-nerved membranous, glabrous; peduncles solitary, 6 to 7 cm. long; bracts ovate, entire, 5 to 6 cm. long, 3 to 4 cm. broad, membranous, attached 1 cm. below the apex of the petiole, completely enveloping the flower, united for about 2 cm., acute, densely puberulent on both surfaces; flower purple, 4 to 5 cm. in diameter, the tube 1 cm. long; sepals oblong-lanceolate, 1.8 to 2 cm. long, 0.8 cm. broad, slightly fleshy, obtuse, strongly keeled, the keel terminating in a

setaceous awn 5 to 6 mm. long; petals linear-lanceolate, 1.5 to 1.7 cm. long, 0.5 cm. broad, thin, obtuse; filaments of faucial corona in several series, the outermost slender, filiform, 7 mm. long, the second series stout, liguliform, attenuate at apex, 1.5 cm. long, white, banded transversely with purple, the succeeding series of about 6 irregular rows of minute tubercles less than 1 mm. long; middle corona arising at base of the innermost of the latter rows, 0.75 mm. long, the margin erect, denticulate; secondary middle corona annular, midway between the preceding and base of gynophore, the margin entire; basal corona fleshy, closely surrounding and adnate to the lower part of gynophore, 3 mm. high, the margin free, erect; gynophore stout, grooved, glabrous, bearing 1 mm. above the margin of the basal corona a single annular process 0.4 mm. wide; filaments flattened, 7 mm. long, 1.2 mm. wide; anthers linear, 10 mm. long, 2 mm. broad; ovary elipsoidal, glabrate.

Type in the U. S. National Herbarium, no 678,715, collected at La Blasa de Río Grande, Province of Alajuela, Costa Rica, June 2, 1911, by H. Pittier (no. 3653).

This species resembles 3-lobed forms of *Passiflora seemanni*. Its bracts are much longer and completely envelop the flower; they are of a thicker texture, are acute rather than rounded at the apex, and are densely puberulent on both surfaces. The sinuses between the central and the lateral leaflobes are biglandular. In *Passiflora platyloba* the lower portion of the faucial corona consists of 4 or 5 definite rows of tubercles; in *P. seemanni* the tubercles are densely massed, apparently not being arranged in any definite order.

Passiflora (*Granadilla*) **purpusii** Killip, sp. nov.

Stem terete, striate, glabrate; stipules in pairs, foliaceous, semiovate, rounded at the base, cuspidate, 2.2 to 2.5 cm. long, 1 cm. broad, glabrous, dark green above, glaucous beneath; petioles 4 to 4.5 cm. long, glabrous, bearing in the upper half 4 to 6 stipitate glands 1.2 mm. long; leaves ovate, 10 to 13 cm. long, 5 to 9 cm. wide, long-acuminate, entire, shallowly cordate, membranous, above dark green and glabrous or minutely scabrous on the nerves, beneath glaucescent, pilosulous or occasionally glabrous, quintuplinerved from base; peduncles 3 to 3.5 cm. long, glabrous; bracts free to the base, ovate-oblong, about 1.5 cm. long, 7 mm. wide, glabrate, dark green above, glaucous beneath; flowers 4 to 5 cm. wide; sepals lanceolate or narrowly ovate-lanceolate, 2 cm. long, united at base for a distance of about 6 mm., cucullate at apex, keeled on the outer surface, the keel terminating in an incurved awn 5 mm. long; petals linear, 1 to 1.2 cm. long, 3 to 4 mm. broad; filaments of faucial corona in about four series, those of the outermost series narrowly linear, filiform at the tips, 1.2 to 1.5 cm. long, those of the succeeding series narrowly linear, slightly capitellate, nearly equal in length, 3 mm. long; middle corona membranous, erect or slightly incurved, the upper half cleft into linear threads; secondary middle corona a minute fleshy ring on the floor of the flower tube, halfway between middle corona and basal corona; basal corona membranous, erect, closely surrounding base of gynophore, 5 mm. high, the margin flaring outward, crenulate; gynophore glabrous, 1.3 to 1.5 cm. long (at anthesis); anthers linear, 8 mm. long, 2 mm. broad; ovary ovoid, glabrous; styles 8 mm. long; stigmas reniform; fruit not seen.

Type in the U S. National Herbarium, no. 877,596, collected at Zacuapan, Veracruz, Mexico, June, 1916, by C. A. Purpus (no. 7664). Duplicate in the herbarium of the University of California. *Purpus* 3689, from the same locality, is also this species.

Passiflora (*Granadilla*) **williamsii** Killip, sp. nov.

Stem stout, terete, minutely puberulent; stipules filiform, 6 to 7 mm. long; petioles 4.5 cm. long, densely puberulent, biglandular about 1 cm. from the base, the glands orbicular, appressed, 2 mm. in diameter; leaves broadly ovate in outline, 10 cm. long, 9 to 10 cm. broad, 3-lobed to middle (lobes acute, the middle one narrowed at base), serrulate, biglandular in the sinuses, at base truncate or slightly subcordate, 3-nerved, membranous, the upper surface glabrate, puberulent on the nerves, the lower surface minutely puberulent; peduncles 3 cm. long, densely pubescent; bracts united at the base, the free part 2 cm. long, 1.5 cm. broad, tomentulose on both surfaces; flowers about 6 cm. wide, the tube 1.2 cm. long; sepals oblong, 2.5 to 3.5 cm. long, 1.2 to 1.5 cm. broad, obtuse, puberulent without, glabrate within, inconspicuously keeled, slender-awned about 2 mm. from the apex, the awn 3 mm. long; petals oblong-spatulate, 2 cm. long, 5 mm. broad, greenish without, within white, spotted with dark pink; filaments of faucial corona in several series, the outermost terete, 6 to 7 mm. long, white, transversely banded with blue, the next series dilated at the middle, 2 to 2.5 cm. long, the succeeding series minute, tuberculate, 1.5 mm. high; middle corona arising close to the faucial, membranous, horizontally spreading inward, 2 mm. long, the margin entire, curved downward; secondary middle corona annular, midway between the preceding and the base of the gynophore; basal corona fleshy, closely surrounded and adnate to the lower part of the gynophore, 5 mm. high, the margin free, erect; gynophore 1.5 to 2 cm. high, 2 mm. in diameter, bearing about 7 mm. above its base a fleshy annular process 0.5 mm. wide, its margin recurved; filaments linear-spatulate, flattened, 1.5 mm. broad; anthers oblong, obtuse at both ends, 8 mm. long, 3 mm. wide; ovary narrowly ovoid, densely white-tomentulose; styles terete, glabrous; stigmas globose, 3 mm. in diameter.

Type in the herbarium of the New York Botanical Garden, collected at Bismarck, above Penonomé, Panama, altitude 600 to 925 meters, March 5 to 19, 1908, by R. S. Williams (no. 585). Photograph in the U. S. National Herbarium.

Passiflora williamsii belongs to the group of the subgenus *Granadilla* which is characterized by partially united bracts. From *P. seemanni*, *P. platyloba*, and *P. ligularis*, the other representatives of this group, it is readily distinguished by its leaves, which are truncate or very shallowly cordate at base and densely puberulent beneath. In the three other species the leaves are deeply cordate and entirely glabrous.

ZOOLOGY.—*New species and subspecies of* Sorex *from western America.*[1] HARTLEY H. T. JACKSON, Bureau of Biological Survey.

Investigations upon American Soricidae for the United States Bio-

[1] Received April 27, 1922.

logical Survey show that in order to indicate properly the relationships of the various forms of the genus *Sorex* it is necessary to describe four new species and subspecies. Inasmuch as completion of my studies of this genus is now within sight, the descriptions and remarks on these new forms are here much abbreviated. More detailed descriptions and discussion of relationships will be presented in the monograph.

Sorex preblei,[2] sp. nov.

Type specimen.—No. 208,032, U. S. National Museum, Biological Survey collection; male adult (teeth moderately worn), skin and skull; collected July 3, 1915, by Edward A. Preble. Original number 5972.

Type locality.—Jordan Valley, altitude 4,200 feet, Malheur County, Oregon.

Geographic range.—Known only from eastern Oregon.

Diagnostic characters.—Smallest of the western forms of the *personatus* group; color paler and more grayish than in *Sorex personatus personatus;* hind foot small. Skull relatively flattened, small, with relatively short rostrum.

Color.—Summer pelage: Upperparts between hair-brown[3] and olive-drab, paling on the sides; underparts pale smoke gray very faintly tinged with cartridge buff. Tail above olive-buff basally, darkening to clove-brown toward tip; avellaneous below, darkening apically.

Measurements of type specimen.—Total length, 95; tail vertebrae, 36; hind foot, 11. *Skull:* Condylobasal length, 14.6; palatal length, 5.4; breadth of cranium, 7.1; interorbital breadth, 3.1; maxillary breadth, 4.2; maxillary tooth row, 5.1.

Sorex obscurus isolatus, subsp. nov.

Type specimen.—No. 177,719, U. S. National Museum, Biological Survey collection; male adult (teeth moderately worn), skin and skull; collected May 21, 1911 by F. Alexander Wetmore. Original number 517.

Type locality.—Mouth of Millstone Creek, Nanaimo, Vancouver island, British Columbia.

Geographic range.—Known only from Vancouver Island, British Columbia.

Diagnostic characters.—About the size of *Sorex obscurus obscurus* or *S. o. parvidens,* but darker than either, particularly on the ventral parts which are also decidedly more brownish. Unicuspidate teeth smaller than in *obscurus,* and the posterior borders of molariform teeth tending to be more deeply emarginate.

Color.—Winter pelage: Upperparts nearest chaetura drab mixed with grayish, gradually blending into color of underparts, which are smoke gray tinged with drab; tail indistinctly bicolor, olive-brown above, buffy brown to almost tawny-olive below.

Measurements of type specimen.—Total length, 113; tail vertebrae, 49; hind foot, 14. *Skull:* Condylobasal length, 17.4; palatal length, 6.6; breadth of cranium, 8.5; interorbital breadth, 3.5; maxillary breadth, 4.9; maxillary tooth row, 6.3.

[2] Named for the collector Mr. Edward A. Preble, friend and coworker, in recognition of his services and contributions to American mammalogy.

[3] Colors here used are those of RIDGWAY, *Color standards and color nomenclature,* 1912.

Sorex trigonirostris, sp. nov.

Type specimen.—No. 203,608, U. S. National Museum, Biological Survey collection; female adult (teeth slightly worn), skin and skull; collected May 5, 1914, by Luther J. Goldman. Original number 1308.

Type locality.—Ashland, altitude 1,975 feet, Jackson County, Oregon.

Geographic range.—Known only from near Ashland, Oregon.

Diagnostic characters.—Similar in size and color to *Sorex ornatus californicus;* mastoid region of skull more angular and prominent than in any other form of the *ornatus* group; rostrum shorter and more angular, the sides less outwardly curved than in *californicus.*

Color.—Summer pelage: Upperparts grayish hair-brown, becoming drab on the sides; underparts between pale smoke gray and pale olive-gray, very faintly tinged with pale olive-buff; tail olive-brown above, avellaneous below nearly to tip.

Measurements of type specimen.—Total length, 95; tail vertebrae, 34; hind foot, 12. *Skull:* Condylobasal length, 15.6; palatal length, 5.8; breadth of cranium, 7.9; interorbital breadth, 3.4; maxillary breadth, 4.5; maxillary tooth row, 5.5.

Sorex trowbridgii humboldtensis, subsp. nov.

Type specimen.—No. 97,271, U. S. National Museum, Biological Survey collection; male adult (teeth slightly worn), skin and skull; collected June 11, 1899, by Walter K. Fisher. Original number 914.

Type locality.—Carson's Camp, Mad River, Humboldt Bay, Humboldt County, California.

Geographic range.—Coast region of Humboldt and northern Mendocino Counties, California.

Diagnostic characters.—Intermediate in general between *Sorex trowbridgii trowbridgii* and *S. t. montereyensis.* About the color of *Sorex t. trowbridgii,* but tending to be larger, with larger and broader skull and heavier dentition. Averaging a trifle darker and less brownish than *Sorex t. montereyensis,* with relatively longer tail; skull with narrower rostrum and weaker dentition.

Color.—Summer pelage: Upperparts between deep mouse gray and chaetura drab or slightly paler; underparts similar in color to dorsal parts, scarcely if at all paler; tail sharply bicolor, fuscous to chaetura black above, whitish below.

Measurements of type-specimen.—Total length, 132; tail vertebrae, 62; hind foot, 14. *Skull:* Condylobasal length, 17.8; palatal length, 7.2; breadth of cranium, 8.9; interorbital breadth, 4.1; maxillary breadth, 5.4; maxillary tooth row, 6.7.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

PHILOSOPHICAL SOCIETY

857TH MEETING[1]

The 857th meeting (the 51st annual meeting) of the Philosophical Society was held in the Cosmos Club auditorium, December 3, 1921. It was called

[1] A report of the 858th meeting was published in this JOURNAL **12:** 186–188. 1922.

to order at 8:15 p.m. by Vice-President WHITE. Thirty-nine persons were present.

The report of the Secretaries showed the present active membership of the Society to be 228, a gain of 15 during the year. The following officers were elected for the year 1922: *President*, E. C. CRITTENDEN; *Vice-Presidents*, J. A. FLEMING and D. L. HAZARD; *Treasurer*, W. R. GREGG; *Corresponding Secretary*, C. A. BRIGGS; *Members-at-large of the General Committee*, H. A. MARMER and IRWIN G. PRIEST.

At the conclusion of the business of the Annual Meeting, Mr. W. J. HUMPHREYS addressed the Society on the subject of *Fogs and clouds*. The address was illustrated by means of numerous lantern slides, and dealt particularly with the different kinds of clouds and their methods of formation.

859TH MEETING

The 859th meeting of the Philosophical Society was held in the Cosmos Club auditorium, January 14, 1922, with President CRITTENDEN in the chair, and 65 persons in attendance.

The address of the evening was given by the retiring president, R. L. FARIS, on *Some problems of the sea*. It was discussed by Messrs. ABBOTT, MARMER, SOSMAN, WILLIAM BOWIE, BURGESS, CRITTENDEN, and WHITE. It has been published in full in the JOURNAL of the WASHINGTON ACADEMY of SCIENCES (**12** : 117–132. 1922).

H. H. KIMBALL, *Recording Secretary.*

860TH MEETING

The 860th meeting was held jointly with the WASHINGTON ACADEMY OF SCIENCES at the Cosmos Club, January 28, 1922, President HUMPHREYS of the Academy presiding. In opening the meeting Dr. Humphreys stated that the snowfall during the preceding 24 hours had been more than double that recorded in Washington for any previous 24-hour period. The attendance at the meeting was 21.

Professor L. T. TROLAND of Harvard University read a paper on *Psychophysics as the key to the mysteries of physics and metaphysics*. This paper has been printed in full in the Journal of the Washington Academy.[2]

The paper was discussed by Messrs. HAWKSWORTH, WILLIAMSON, SOSMAN, PRIEST, CRITTENDEN, HEYL, FOOTE, H. E. IVES, TUCKERMAN, and HUMPHREYS.

E. C. CRITTENDEN, *Recording Secretary, Pro tem.*

861ST MEETING

The 861st meeting was held at the Cosmos Club auditorium, February 11, 1922, with President CRITTENDEN in the chair and 40 persons present. The following program was given:

EDWARD WICHERS: *The purification of certain elements in the platinum group.*

(Author's abstract.) The need for public information on the elements of the platinum group led the Bureau of Standards to conduct an investigation of the properties of these elements and their alloys. The precision required in the determination of physical properties made it necessary to prepare each of the elements in a state of highest possible purity. These very pure metals will also be used as material for the study of analytical methods for the platinum group.

[2] This JOURNAL **12**: 141–162. 1922.

Two methods for the isolation of a chemical individual were discussed. The first of these is the treatment of a solution containing two elements in such a way as to obtain a compound of one element with properties characteristically different from the analogous compound of the other element. An example was drawn from the treatment of a solution containing copper and silver with hydrochloric acid, forming a very slightly soluble chloride of silver and a very soluble chloride of copper, thereby permitting the isolation of silver.

The other method is required when the elements are so nearly alike in their properties that they react identically with all reagents. This condition is exemplified by the group of sixteen elements known as the "rare earths." This group forms complete series of isomorphous salts, and separations between two (or more) members are usually accomplished by fractional crystallization. In the platinum group either method may be used, although the former is used more frequently because it is more rapid. However, in one large platinum refinery, platinum is separated from iridium by the fractional crystallization of the isomorphous salts Na_2PtCl_6 and Na_2IrCl_6.

It is also possible by appropriate means to treat solutions of iridium and platinum in such a way as to reduce iridium from the tetravalent to the trivalent condition, without appreciably affecting the platinum. Iridium now behaves as a different chemical individual and its double chloride with ammonium chloride is quite soluble and not isomorphous with $(NH_4)_2PtCl_6$.

Such treatment would then effect a very rapid purification of platinum, except for the phenomena of "co-precipitation," which is very marked in this whole group of elements. Because of this the precipitate of $(NH_4)_2PtCl_6$ is contaminated with iridium, and the preparation of platinum in a high degree of purity is made possible only by several re-precipitates of the compound named.

In the purification of palladium use is made of the characteristic compound dichlbrodiammine-palladium-$Pd(NH_3)_2Cl_2$. For rhodium two salts are used, the first refining being accomplished by the use of the insoluble salt $K_3Rh(NO_2)_6$, and the subsequent preparation of chloro-pentamine, rhodium chloride $(Rh(NH_3)_5Cl)Cl_2$. For iridium no similar characteristic compound is known and iridium must be purified by the opposite procedure of removing other elements from the solution first.

Ruthenium and osmium may be separated from the other platinum elements through the volatile tetroxides RuO_4 and OsO_4.

In the case of platinum, palladium and rhodium, it is to be noted that in each case a salt is chosen which may be ignited directly to metal, leaving no other nonvolatile constituents.

Brief mention was made of the work done on the precautions necessary to avoid contamination in the melting of the purified platinum sponge.

C. O. FAIRCHILD: *Thermo-electric tests for the purity of some metals* (illustrated).

(Author's abstract.) The thermo-electric test is performed by making a thermocouple of two metals and measuring its e. m. f. at a known temperature; for example two pieces of gold from different sources may be compared at the melting point of gold. If the thermal e. m. f. is large, one or both of the samples are quite impure. If the e. m. f. is small then time is well spent in further study of the samples. The test is particularly suited to comparing metals of the highest purity, containing only spectroscopic traces of one or a very few metals.

Knowledge of the thermoelectric effect of small traces of impurities is limited. A thermoelectric difference is irrefutable evidence of difference of the two metals. (These should be carefully annealed so that the physical condition is constant.) No difference, that is a negative result, raises doubt. Perhaps more than one impurity gives opposite effects.

Special study has been made of pure platinum, pure gold and pure palladium, the purity being of the highest order. In the three cases the purest samples as selected by other tests have been the most negative thermoelectrically. As an illustration of the magnitude of the e. m. f's. afforded by traces of impurity, two pieces of platinum one spectroscopically free of any detectable impurity and one indicating the faintest trace of calcium (or lime) as an impurity, gave a thermal e. m. f. of about twenty micro-volts at 1200° C. Probably there is a very wide variation in the effect of constant amount of different impurities.

As a beginning, a series of platinum rhodium alloys, containing respectively 0.001%, 0.01%, 0.1%, 0.5%, and 1.0% of rhodium were made. Spectroscopic examination gave no evidence of impurity. The e. m. f. of each alloy against platinum at 1083° C. was measured. It was found that the e. m. f. was proportional to the rhodium content up to about 1.0%. The accuracy of the whole procedure, including the synthesis and electrical measurement, was ± 4 microvolts from strict proportionality. All these alloys are positive to platinum. This is not the case with gold-palladium alloys which will be tried next to show whether or not the thermoelectric effect of a trace of an impurity is the same in sign as the two metals of the alloy. Is 99.999% Pd-.001% Au positive to palladium?

W. F. MEGGERS: *Spectrographic tests for the purity of some metals* (illustrated).

(Author's abstract.) In connection with the purification of certain elements in the platinum group carried out by Dr. Wichers at the Bureau of Standards, spectrographic analysis was employed to indicate the progress of purification and to detect the traces of impurities present in the final product. The metals were vaporized and ionized in a high potential electrical spark with capacity and self-inductance in the circuit. Alloys or mixtures of elements made luminous in this source give, simultaneously, the spectra of all the elements present and these spectra are recorded photographically with the aid of a quartz or a concave grating spectrograph. If one observes the spectra of a series of mixtures in which one element is progressively diluted it is seen that the spectrum of this element becomes simplified, more and more lines disappear, as the dilution increases, until a single line remains faintly visible when a mere trace of the element is present. These most sensitive lines were called "raies ultimes" by DE GRAMONT[3] to whom much credit is due for developing the principles of this method of analysis.

The raies ultimes are exceptionally sensitive for all metals and remain visible when the concentration of an element in an alloy or mixture is even less than 0.0001 per cent. A trained observer after studying the partial spectra of carefully prepared standard samples can apply this information to making rapid and fairly accurate quantitative analyses of similar alloys of unknown percentage composition. The empirical basis for such spectrographic tests has been developed at the Bureau of Standards, especially for the analysis of mint gold and of platinum metals. Some of the physical constants of metals,

[3] DE GRAMONT. Ann. Chim. et Phys. VIII, **17**: 437. 1909.

particularly the thermal electro-motive force and thermal coefficient of electrical resistance, are sensitive even to spectroscopic traces of impurities. The spectograph showed that when the purest platinum sponge was fused on lime or magnesia it was usually contaminated with traces of calcium and magnesium but when fused on thoria no impurities could be detected. With the aid of this method of spectrographic analysis platinum metal has been prepared which is positively 99.9999 per cent pure.

Discussion of the three papers was participated in by Messrs. BURGESS, WHITE, FOOTE, L. H. ADAMS, HARPER, and HUMPHREYS.

862D MEETING

The 862d meeting of the Philosophical Society was held in the Cosmos Club auditorium, February 25, 1922, with President CRITTENDEN in the chair and 54 persons present. The program was as follows:

R. S. WOODWARD: *The calculus of harmonics and preharmonics and their application in hydromechanics.* It was discussed by Mr. L. A. BAUER.

(Author's abstract.) A harmonic function, H, is defined to be any homogeneous function of x, y, z, which satisfies Laplace's equation. That is, H is a harmonic if

$$\frac{\partial^2 H}{\partial x^2} + \frac{\partial^2 H}{\partial y^2} + \frac{\partial^2 H}{\partial z^2} = 0.$$

This equation is now, for brevity, commonly written

$$\Delta^2 H = 0, \text{ or } \Delta H = 0.$$

and the operation thus symbolized is called the Laplacian of H.

Conformable to these definitions, a preharmonic function, P, is defined to be any homogeneous function of x, y, z which satisfies the equations

$$\Delta^2 P = H, \Delta^2 \Delta^2 P = \Delta^2 H = 0.$$

Corresponding to every harmonic function, therefore, there is a preharmonic function determined by the integral of the first of the last two equations; and since there is an extensive range of harmonic functions, of which the degrees may be positive or negative integers, or fractional or imaginary numbers, there is a coextensive range of preharmonic functions.

While harmonic functions have been investigated in elaborate detail, it does not appear that much attention has been given to the intimately related functions here called preharmonics. It was the object of the paper to outline the characteristics of these functions and the calculus to which they lead, as well as to indicate some of their more important applications. General formulas for all of the preharmonics corresponding to all the harmonics of positive and negative integral degrees were given.

L. A. BAUER: *Some results of recent earth-current observations* (illustrated).

(Author's abstract.) Renewed interest was aroused by the remarkable earth-current disturbances of May 14 to May 30, 1921, which, as will be recalled, occurred simultaneously with brilliant displays of polar lights and severe magnetic storms, the sun at the time showing remarkable spot activity. These disturbances and accompanying phenomena occurred over the entire earth. Northern lights were observed in lower northerly latitudes than usual and southern lights were observed as far north in the Southern hemisphere as Apia, Samoa—a very unusual occurence. In many respects the disturbances during the period, May 14 to 20, 1921 were similar to

those which occurred during the period, August 29 to Sept. 4, 1859; in this latter case, northern lights were visible as low as 18° north. The magnetic disturbances for the latter period were of almost unexampled size and rapidity, the accompanying aurora being extraordinarily brilliant and e. m. f's. of 700 to 800 volts are said to have been reached on telegraph lines 500 to 600 km.

Since Oersted's discovery somewhat over a century ago of the deflection of a compass needle by an electric current, hypotheses have been repeatedly advanced respecting the earth's magnetic field as caused by electric currents in the earth's crust. However, most of the earth-current observations made up to the present date indicate that the constant part of the observed current along a parallel of latitude is chiefly towards the east, instead of towards the west, as would be necessary to account for the observed phenomena of the magnetic needle.

At the International Electric Congress, held in Paris in 1881, such interest was aroused that systematic investigation of earth currents, especially as observed in telegraph lines, was undertaken in various countries. This material was furnished for Weinstein's well-known publication in which data obtained on two telegraph lines (Berlin to Thorn and Berlin to Dresden) from 1884 to 1887, were successfully utilized.

Unfortunately, the interest then aroused has waned and, as far as known, there is at present only one observatory where systematic earth current observations are being made, namely, at the Observatorio del Ebro, Tortosa, Spain, where the series of observations began in 1910. The speaker proposes to arouse renewed interest in this important subject at the forthcoming Rome meeting of the International Geodetic and Geophysical Union.

The Department of Terrestrial Magnetism is planning to install earth-current lines for systematic observations at its magnetic observatories. This year, it is hoped that such lines may be installed at the Department's Observatory at Watheroo, Western Australia. Various initial investigations have been in progress at the Department's Laboratory and Dr. Mauchly made a report to our Society some years ago. To Mr. O. H. Gish, appointed recently as Associate Physicist of the Department, has been assigned the continuation of these investigations. Furthermore, in order to take advantage of the experience in such work gained at the observatory in Spain and to ascertain the direction in which further study is desirable, a discussion of the eleven-year series at the observatory mentioned was undertaken under the direction of the speaker.

Slides were shown exhibiting the relations between variations of earth-currents, especially of the diurnal variations, and solar activity during the eleven years cycle. The relations between the diurnal variations of earth-currents and those of the earth's magnetic elements were also briefly discussed. It would appear that the relations are of a rather complicated character.

863D MEETING

The 863d meeting was held at the Cosmos Club March 11, 1922, with President CRITTENDEN in the chair and 70 persons present.

WILLIAM BOWIE: *The yielding of the earth's crust* (illustrated). It was discussed by Messrs. WASHINGTON and HAYFORD.

(Author's abstract.) The theory of isostasy postulates that blocks of the crust of the earth are in equilibrium. The investigations carried on by the U. S. Coast and Geodetic Survey and the Trigonometrical Survey of India

lead us to believe that the theory of isostasy is substantially true and that the amount of matter in blocks of the crust of equal cross section at the depth of compensation is very nearly equal in various parts of the earth.

Since the earth's crust is in hydrostatic or isostatic equilibrium now it is a logical conclusion that it has been so during the earlier geological periods and therefore we must conclude that movements within the earth's crust which are recorded in geological strata and structures did not materially increase the amount of matter in any block of the crust.

There are four rather distinct movements of material within the earth's crust or at its surface. First the transportation of material by wind and water from one place to another over the surface. Second, a downward movement of the material of the earth's crust under the area of sedimentation, some of this movement being due to a yielding under the load of the sediment and the remainder to thermal contraction and a contraction due to physical or chemical action. Third, a movement below the earth's crust, in a more or less horizontal direction, of material which is yielding to long continued horizontal stress. This material flows from the block of the earth's crust on which sediments are placed toward the block from whose surface material was eroded. The fourth is the upward movement of the material in a block of the earth's crust under the area of erosion. As the material is eroded from the surface, the isostatic balance is restored by the entering of material at the bottom of the block, thus causing the block to rise.

It seems to be reasonably certain that mountain systems are caused by a vertical uplift due to local causes rather than to horizontal thrusts resulting from forces acting from great distances. The distortions of sedimentary rocks which are visible in most elevated regions appear to be incidents to the sinking of an area under sedimentation and to subsequent uplifting of the area. As an area once subject to sedimentation is uplifted, and since this uplift must be a result of a change in density within the block, the upward movement would follow lines of least resistance. The direction of such lines would frequently be inclined to the vertical and at times be almost or quite horizontal.

The change in density in a block of the earth's crust which has undergone heavy sedimentation may be due to the fact that the material of the block has been pushed down into regions hotter than that originally occupied. The shrinking and increase of density of a block under an area of erosion may be due to the fact that many thousands of feet of material had been eroded, thus resulting in the raising of the material of the block below the area into regions that were much cooler than that which the material had originally occupied. This change in temperature, which may be as much as 200 or 300 degrees Centigrade, may cause a thermal contraction as well as an increase in density due to physical or chemical changes other than the thermal expansion.

It is certain that the theory of isostasy must be taken into consideration in geological investigations, especially those having to do with dynamic and structural geology.

H. V. SVERDRUP: *The scientific work of the present Amundsen Arctic Expedition* (illustrated). It was discussed by Messrs. MARMER and BEALL.

(Author's abstract.) Captain Amundsen's Expedition left Norway in July, 1918, with the intention to follow the coast of Siberia eastward to the vicinity of Bering Strait, proceed thence towards the north, let the vessel, the "Maud," freeze in and drift with the ice fields across the Polar Seas back

to the Atlantic Ocean. The main object of the Expedition was to study the physical conditions of the Polar Sea, but along with the oceanographical work, a number of other observations, mostly of geophysical interest, were to be carried out. However, the Expedition was forced by the ice conditions to winter three times in different places on the coast of Siberia.

The first wintering took place close to Cape Chelyuskin, the north point of the Asiatic continent. During this winter, registrations of the meteorological elements, the magnetic declination and the tides were secured. A tidal gage, adapted to the special conditions met with, was made on board. Numerous direct observations were also made. The difficulties in observing at low temperatures did not arise so much from the effect of the cold upon the observer, who could dress conveniently, as from the effects upon the instruments, particularly the inevitable formation of frost upon eye-pieces and verniers. In the spring the Chelyuskin Peninsula was explored on sledge trips covering over 1000 miles.

When leaving Cape Chelyuskin, Captain Amundsen decided to send all observations home with two men, who were to bring them to the nearest settlement, a Russian wireless station at Dickson Island. These men lost their lives. All records from the self-registering instruments are lost with them, but copies of all absolute observations exist.

The second wintering took place at Ayon Island, 700 miles west of Bering Strait. The speaker spent the winter among the natives, a group of the Chukchi tribe, gathering information of ethnological interest. Magnetic observations were taken at a series of stations from Kolyma River to Bering Strait, and meteorological and tidal registrations and observations were kept up on board the "Maud."

After a call at Nome in July, 1920, the "Maud" was frozen in for the third time, only 80 miles west of Bering Strait. During the winter, additional information about the natives was secured on a two and one-half month's sledge trip along the coast; the series of magnetic stations was extended to Holy Cross Bay, and registrations were kept up on board.

In the summer of 1921, the vessel of the Expedition had to be sailed to Seattle for repairs. Capt. Amundsen intends to start out from Seattle in June, 1922, and will once more try to penetrate to the drifting ice fields in order to accomplish the drift across the Polar Sea.

864TH MEETING

The 864th meeting was held at the Cosmos Club March 25, 1922, with President CRITTENDEN in the chair, and 35 persons in attendance.

The President announced that the Recording Secretary expected to be absent from Washington until July, 1922, and that Mr. H. A. MARMER had been designated to act as Secretary *pro tem* during this period. Program:

C. O. FAIRCHILD and W. H. HOOVER: *A disappearing filament optical pyrometer free from diffraction effects at the filament* (illustrated, presented by Mr. Fairchild). It was discussed by Messrs. CRITTENDEN and HUMPHREYS. (Author's abstract.) This pyrometer consists of a telescope or microscope in the focal plane of which is a small electric lamp. To estimate temperature of an object, its brightness is matched with that of the lamp filament by adjusting the current through the lamp. An equation such as $I = a + bt + ct^2$ may be used to interpret current values.

For measuring high temperatures this pyrometer is particularly suited, but one of its supposed faults, and a source of uncertainty in its accuracy, has

been the effect of diffraction of the light focussed in the plane of the filament, by the filament.

A rigorous solution of the problem of diffraction by an obstacle in the focal plane has not been attempted. It can be shown by deduction that only the light diffracted by the objective aperture is again diffracted by the filament; while the undiffracted portion of the converging beam passes the filament undisturbed. To avoid a visible effect of diffraction the filament and image are viewed through an aperture smaller than the objective in angular measure. The actual values of the entrance and exit apertures of the telescope depend on various factors. Large entrance apertures must be used.

As a result of improvements in the design of this optical pyrometer, the precision attainable has been markedly increased, now surpassing, probably, that of the contrast photometer. High temperatures are easily estimated to fractions of a degree, far within the limits of certainty of the so-called high temperature scale. The disadvantage lying in the use of the optical scale founded on the Wien-Planck laws, instead of the radiation scale of Stefan-Boltzman laws, is balanced by the extreme ease of manipulation and high precision attainable. However, the lack of agreement between the different scales of temperature is at present not great, nor serious, and has been found negligible for most purposes.

A form of micropyrometer has been devised for measuring the temperature of a microscopic or very small object with the same precision as with large objects. For example a small lamp filament or a minute black-body furnace can be examined.

The writers believe that significant progress has been made toward placing this form of optical pyrometer in sound relation with the laws of geometrical and physical optics, and in developing an instrument of precision.

S. P. FERGUSSON: *Equipment for aerological kite-flying at the greatest possible heights* (illustrated). It was discussed by Messrs. L. H. ADAMS, CRITTENDEN, HUMPHREYS and TUCKERMAN.

(Author's abstract.) With kites and accessories in use at the present time the average heights attained are about 3500 meters and the maximum about 7000. From an experimental study of materials, forms of kites, methods of construction, lines, etc., the author has found that these heights can be increased considerably if the largest kites and the largest sizes of wire for lines are used. Large kites are more economical and are so much stronger than smaller ones of nearly the same specific weight that there is no danger of wrecking a kite in the strongest wind likely to be encountered aloft; also they are steadier and more stable and since their specific weight when carrying the usual recording instruments is smaller, ascensions are possible through a wider range of conditions. By the use of curved lifting-surfaces the average altitudes can be increased to about 64°, or nearly 8° higher than that attained by kites with flat surfaces, and curved-surfaced kites will maintain a higher altitude in strong winds.

A new method of building kites was described whereby the time and cost of constructing aerological kites is less than one half that required to produce kites of the usual patterns and the processes of adjustment and repairing greatly simplified.

With kites and accessories described in which harmful resistances have been reduced to the lowest point easily attainable, ascensions may be extended to a greater average height than has been possible heretofore with less labor and

smaller risk to valuable apparatus; also, by taking advantage of favorable conditions, it appears possible to reach the level of the cirrus clouds, and the base of the stratosphere, or a maximum height of approximately 10,000 metres.

H. H. Kimball, *Recording Secretary.*

ENTOMOLOGICAL SOCIETY

341ST MEETING

The 341st regular meeting was held June 2, 1921, in Room 43 of the National Museum with First Vice-president GAHAN in the chair, and 16 members and 6 visitors present.

The program consisted entirely of *Notes and exhibition of specimens.*

Dr. L. O. HOWARD spoke of the Hessian fly parasite *Entedon epigonus.* An attempt was made to introduce this species into the United States thirty or more years ago. It was recovered by FORBES the second year later and by ASHMEAD seven years later, but had apparently disappeared thereafter. It is now breeding abundantly in three localities.

Dr. HOWARD also told of having attended a recent meeting of the American Entomological Society in Philadelphia and spoke in high praise of a talk given at the meeting by MORGAN HEBARD on a trip to Colombia.

A. B. GAHAN expressed doubt if the presence of *Etendon epigonus* is due to the artificial introduction, pointing out that it has ample opportunities to be introduced accidentally.

A. N. CAUDELL recorded the finding in Washington of two masses of eggs of the praying mantis, *Ptenodera chinensis.* Mr. ROHWER stated that he had liberated some in Falls Church, Virginia, and that they had disappeared after a few days and none had been found since.

H. S. BARBER discussed a new strawberry pest discovered at Miami, Florida, by Mr. MOZNETTE. This is a bluish green weevil of the genus *Atypus.* E. A. SCHWARZ discussed the confusion of names in this genus, which is common to the West Indies and the southeastern part of the United States as far north as New Jersey. S. A. ROHWER spoke of Hymenoptera common to both regions, and stated that variation is greater in Porto Rico than in Cuba or the United States. A. B. GAHAN mentioned the bracoinid *Apanteles grenadensis* Ashm. (synonym, *A. harnedi* Vier.), a parasite of *Laphygma frugiperda.* This species occurs in the West Indies, Brazil, and in the United States as far north as Tennessee. Mr. CAUDELL stated that certain Orthoptera known to occur in Florida and Costa Rica do not occur in the West Indies. Mr. SCHWARZ stated that there was formerly a land connection between the West Indies and Yucatan.

R. A. CUSHMAN spoke of the synonymy of certain species of *Amblyteles,* which synonymy was proved by the introduction of the species into Hawaii and their subsequent recovery.

C. T. GREENE announced the return by Dr. FELT of the National Museum material of *Itonididae.* This consists of 775 slides embracing 71 genera and 267 species, 174 being type material. There is also determined the work of 40 species.

A. N. CAUDELL exhibited a copy of the very rare paper by KELCH, *Grundlage zur Kenntniss der Orthoptera Oberschlesiens,* in which appeared for the first time some of FIEBER'S genera. He also spoke of the value to the working entomologist of a well catalogued library of separates.

W. B. WOOD told of the finding at the inspection house of a living larva of the pink boll worm in wild cotton from India. This cotton has small seeds and the larva was working from the outside. Mr. BARBER stated that the insect feeds in the same way on okra seed.

Dr. HOWARD told of the death by suicide of the Russian Entomologist KJURDUMOV.

S. A. ROHWER spoke of a paper by Prof. COCKERELL on the Bees of Madeira. Madeira originally had no bee fauna and all the present species are related to the Palearctic forms.

342ND MEETING

The 342nd meeting was held October 6, 1921, at the National Museum, with First Vice-president GAHAN in the chair and 28 members and 10 visitors present.

J. M. ALDRICH: *Collecting in Alaska.*

Dr. ALDRICH gave an account, illustrated by lantern slides, of his summer's collecting in Alaska, during which he traversed the entire length of the government railway. He also described the differences in climate, topography and flora of the various parts of the road, and mentioned some of the more interesting insects, especially Diptera, that he captured. He commented especially upon the great abundance of mosquitoes and the apparent absence of the house fly.

Notes and exhibition of specimens

Dr. J. M. ALDRICH exhibited photographs of two series of exuvia of larvae of the museum pest, *Trogoderma tarsale*, one showing the decrease in size from instar to instar in starved larvae, and the other showing the successive instars of a single larva that had been alternately starved and fed for nine years During this period it had three times attained maximum size and twice decreased practically to first instar size.

A. N. CAUDELL read a note from his entomological journal recording his observations on a specimen of the psammocharid wasp, *Anoplius illinoiensis* Robertson. This wasp was apparently bathing, during the operation descending into the water to the depth of three inches and walking on the bottom.

R. A. ST. GEORGE gave some phenological records on cerambycids in comparison with plant events in 1921. The season in this respect was as a whole abnormal, but especially in two species, *Neoclytus erythrocephalus* and *Xylotrechus colonus*, each of which passed through two generations instead of the normal one generation.

Dr. A. L. QUAINTANCE exhibited apples from Wenatchee, Washington, injured by the pear leaf blister mite.

A. B. GAHAN spoke of having recently received a specimen of *Pachycrepoideus dubius* Ashm., a chalcid parasite of diptera, reared from the cheese skipper, *Piophila casei*. This is the first record of a parasite of this species of which he had heard.

J. C. BRIDWELL exhibited living specimens of the Bethylid, *Sclerodermus macrogaster*, and briefly outlined the habits of members of the genus, which live gregariously on insect larvae, feeding both as larva and as adult on the juices of the host.

R. A. CUSHMAN, *Recording Secretary.*

BOTANICAL SOCIETY

155TH MEETING

The Botanical Society held its 155th regular meeting at the Cosmos Club, on December 6, 1921, with President SAFFORD in the chair.

Prof. DAVID LUMSDEN and Mr. FRED C. MEIER were elected members of the Society.

A communication was received from Mr. C. R. BALL in reference to an autograph letter from HENRY MUHLENBURG, the noted botanist, written September 25, 1809 to Dr. JOHN OTT at Georgetown, D. C., enclosing a list of 195 species of plants apparently collected by Dr. Ott in the vicinity of Washington, D. C.

The Secretary then read a letter from Mr. SHAPOVALOV and one from Dr. L. R. JONES of the National Research Council, to the effect that the movement fostered by the Botanical Society to secure American scientific literature for Russian scientists had met with success, and the National Research Council approved this project and had appropriated $1,000 to carry out the plan. Mr. Shapovalov's efforts as a committee of one from the Botanical Society to the Washington Academy of Sciences to consider sending literature to Russian scientists have come to a successful end and he desires to terminate his appointment.

Under *Brief notes and reviews of literature* Dr. SHANTZ presented the second volume of Burgerstein's work on transpiration. This brings the review of literature down to 1920.

Mr. M. B. WAITE told of seeing specimens of *Myrica carolinensis* collected near Camp Meade. Dr. FAIRCHILD stated that a specimen of *Myrica rubra* from China collected by Mr. Frank Meyer fruited at Chico, California and at Brooksville, Florida. This species represents a large fruit industry in China.

The regular program was as follows:

F. WILSON POPENOE: *Hunting new plants for American horticulture in the highlands of Central and South America* (illustrated).

For some years the Office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry has been engaged in studying the wild and cultivated avocados of tropical America, and in introducing the most promising ones for trial in California and Florida. In both these States avocado culture is now established on a commercial basis, and the demand for new varieties of this fruit, to fill certain needs such as different seasons of ripening, is keen.

The two years' exploration reviewed in this talk covered the most important avocado-growing regions between Guatemala and Chile. In the former country, where 16 months' work had already been done in 1916–1917, a large quantity of avocado seeds of known parentage was obtained for use in producing stock-plants on which to graft superior varieties of this fruit. In Costa Rica several promising kinds were obtained and sent to Washington, also seeds of the *aguacate de anis*, a wild avocado of considerable interest. In Colombia a study was made of the numerous avocados found in the Santa Marta regions, as well as those of Cundinamarca and the Cauca Valley; and one variety was sent to the United States for trial. In Ecuador a number of very choice forms were found in a region hitherto unknown as a producer of good avocados. A brief study was made of the various sorts which grow in Peru and Chile, but none was found worthy of introduction into the United States.

In addition to avocados, numerous other economic plants were investigated, and propagating material of the most promising was sent to Washington. In Guatemala a thousand plants were obtained of the *pacayito*, a handsome dwarf *Chamaedorea* suitable for house culture; seeds and plants of several wild blackberries were collected, as well as seeds of the handsome *Dahlia maxonii* and other plants.

In Costa Rica a particular study was made of the *pejibaye* palm (*Guilielma utilis*), and a quantity of seeds was secured; seeds of several interesting species of Rubus, and other plants, were likewise sent to Washington.

In Colombia many interesting and little-known plants were studied. Perhaps the most striking is *Rubus macrocarpus*, the giant Colombian Berry, of which plants were sent to Washington.

From Ecuador were sent many varieties of the potato, including the wild form; a cultivated variety of *Fragaria chiloensis;* a large-fruited form of *Prunus salicifolia;* several varieties of *Rubus glaucus*, *R. adenotrichos*, and other species of Rubus; several hardy Caricas, and other plants.

From Chile were sent numerous aphis-resistant varieties of the apple; several peaches, plums and cherries of Chilean origin; three cultivated forms of *Fragaria chiloensis;* and the Capuchine orange, a dwarf variety of *Citrus sinensis*.

LOUIS C. C. KRIEGER: *A sketch of the history of mycological illustration* (*Higher Fungi*).

The development of the methods employed in mycological illustrating was traced from the time of Clusius (1601) to Boudier (1910). It was pointed out that truthful illustrations add much to the completeness of the record of so perishable a plant as a fleshy fungus.

Clusius was taken as the starting-point of the historical sketch for the reason that his illustrations (especially the original water-colors from which the wood-cuts in Clusius' work were made, which have recently been published by Istvanffi) are the first truthful figures available to the mycological systematist, those of the herbalists, prior to Clusius, often showing fanciful embellishments.

The gradual development of the technical processes, from wood-engraving through copper-engraving, lithography, half-tone, heliogravure, and tricolor printing, was described by the speaker, illustrations from the classic works of Schaeffer, Bulliard, Letellier, Sowerby, Greville, Fries, Tulasne, and Boudier, serving as examples of the progress in technique.

In concluding his remarks, Mr. Krieger spoke of the dearth of published colored illustrations of American origin, and the hope was expressed that Dr. Howard A. Kelly, of Baltimore (with whom Mr. Krieger is associated in mycological work) might succeed in publishing an illustrated revision of the late Prof. Peck's monographs.

This paper, with suitable illustrations, is to be published elsewhere in full The address was illustrated by lantern slides as well as by copies of several rare mycological books, and by a score or more of Mr. Krieger's own artistic studies of some of the higher fungi.

ROY G. PIERCE, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

The National Academy of Sciences held its annual meeting in Washington on April 24, 25, and 26. The scientific sessions open to the public were held

in the Museum auditorium on the first two days of the meeting. Among the members of the Smithsonian staff who read papers were Secretary C. D. WALCOTT, *The new building of the National Academy and National Research Council;* Dr. L. O. HOWARD, *A side effect from the importation of parasites of injurious insects;* Dr. ALEŠ HRDLIČKA, *Stature amd head form in Americans of old families;* AUSTIN H. CLARK, *Animal evolution;* DR. ABBOT, Mr. FOWLE, and Mr. ALDRICH, *The larger results of 20 years of solar radiation observations.*

The third International Conference on Chemistry will be held at Lyon, France, June 27–July 2, 1922, under the direction of the *Fédération Nationale des Associations de Chimie de France.* It will be followed by the second congress of industrial chemistry, organized by the *Société de Chimie Industrielle,* at Marseilles from July 2 to 7.

The Smithsonian Institution has recently made arrangements for the resumption of exchange relations with Roumania, the Institutal Meteorologic Central, Ministerul Agriculturei, Bukharest, having offered to act as the Roumanian Agency. The Institution is now sending exchange consignments to all foreign countries except Jugoslavia, Russia, and Turkey. The following newly established governments are included among these to which shipments are being forwarded: Czechoslovakia, Esthonia, Finland, Latvia, Lithuania, Poland.

The United States National Museum has recently secured by purchase, through the cooperation of the United States Department of Agriculture, the large private herbarium of Dr. OTTO BUCHTIEN, formerly Director of the Museo Nacional, La Paz, Bolivia, built up by him through many years of botanical exploration in South America and through exchanges with institutions in many parts of the world. The herbarium consists of approximately 45,000 specimens, and is notable for its large proportion of tropical American species, particularly of the floras of Bolivia, Chile, Argentina, and Paraguay.

Among the delegates to the meeting of the International Geophysical Union at Rome are Drs. L. A. BAUER, Department of Terrestrial Magnetism, Carnegie Institution of Washington; HENRY S. WASHINGTON, Geophysical Laboratory, Carnegie Institution of Washington; WILLIAM BOWIE, Coast and Geodetic Survey; G. W. LITTLEHALES, Hydrographic Observatory; and H. H. KIMBALL, Weather Bureau.

The Alaskan Mineral Resources Division of the U. S. Geological Survey has been raised to a Branch, and Mr. A. H. BROOKS is now designated the Chief Alaskan Geologist.

A shipment of material collected in the Province of Fukien, southeastern China, has recently been received from ARTHUR DEC. SOWERBY. It contains many birds and animals not previously represented in the National Museum. This is the first shipment received from Mr. Sowerby from southeastern China, a section of the country from which the Museum has very little material. Through Mr. Sowerby's previous work the mammal fauna from northern China is now very well represented in the Museum, making this South China material of special interest.

Eighteen of the ornithologists of Washington met at the home of B. H. SWALES on March 14, 1922, for the purpose of organizing an ornithological club. As it was the intention at the start to meet at members' homes for informal social intercourse, the number had necessarily to be restricted, and twenty-five was fixed as the limit and only men primarily interested in birds considered. Dr. T. S. PALMER was named temporary chairman and upon

vote it was decided to call the society the "Baird Club." Dr. A. K. FISHER was elected president, NED HOLLISTER, vice-president, and B. H. SWALES, secretary.

The Archives of the Bureau of American Ethnology have been enriched through a gift from W. B. CABOT, of Boston, of a collection of about 3,700 Algonquian names with their variations in spelling. These names for the most part are not found in Lithgow's Algonquian dictionary.

The meeting of the Petrologists' Club at the home of H. G. FERGUSON on February 14 was devoted to a discussion of West Indian petrology. W. S. BURBANK and H. S. WASHINGTON discussed the rocks of Haiti; F. H. MOFFIT, those of Cuba; and C. P. ROSS, those of Santo Domingo. H. S. WASHINGTON described the chemical and physical properties of some Central American jades which are of archeological as well as petrological interest.

A meeting of the Pick and Hammer Club was held on Saturday, March 25, at the Geological Survey, with the following program: J. S. BROWN: *Unusual springs in the Republic of Haiti;* F. W. CLARK: *The composition of surface waters of the United States with respect to areal geology and climate, and the interpretation of the latter factors from water analyses.*

S. R. Capper, geologist in the U. S. Geological Survey, has been furloughed for a year to do commercial work abroad for an American company.

WILLIAM T. CARRIGAN, one of the senior assistants in the Nautical Almanac Office, U. S. Naval Observatory, died at Washington, D. C., on January 20, 1922. He assisted in the research work carried on by the late Prof. SIMON NEWCOMB, and published a number of papers on astronomy.

CHARLES HENRY DAVIS, 2nd, Rear Admiral, retired, U. S. Navy, twice Superintendent of the Naval Observatory, died at Washington, D. C., December 27, 1921. He graduated from the Naval Academy in 1864, and from 1875 till 1885 was engaged principally in astronomical work, at first in the Naval Observatory at Washington, in the Department of Chronometers, and then in expeditions for the determination of longitudes by means of the submarine cables. His publications refer chiefly to the results of such work in various parts of the world.

GEORGE R. DAVIS, Topographic Engineer in charge of the Pacific Division of the U. S. Geological Survey, died on March 31, and Mr. T. G. GERDINE has been put in charge of that division, including Hawaii.

Miss FRANCES DENSORE, collaborator of the Bureau of American Ethnology in Indian music, has collected during the past winter 101 Yuma, 40 Cocopa, and 10 Mohave songs in addition to other important musical material. Among the most important novelties are remarkable observations on a "Memorial," or cremation ceremony held annually by the Mohaves over those who have died during the year.

NEIL M. JUDD, Curator of American Archeology, left for New Mexico on May 1 to resume direction of the National Geographic Society's Pueblo Bonito Expedition. During Mr. Judd's absence JOHN L. BAER will again serve as Acting Curator of American Archeology.

Dr. WILLIAM M. MANN has returned from his South American trip, in which he was Director of the Mulford Biological Exploration on the upper Amazon for several months. He brought back over a hundred live animals and extensive collections of many kinds, especially of insects.

Mr. GLENN S. SMITH has been assigned charge of the Rocky Mountain Division of the U. S. Geological Survey. He will also retain supervision of the Division of West Indian Surveys.